BRITISH COLUMBIA
MINISTRY OF FORESTS

Tree Farm Licence 35

Weyerhaeuser Company Limited

Rationale for Allowable Annual Cut (AAC) Determination

Effective March 1, 2004

Ken Baker
Deputy Chief Forester

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Objective of this Document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed in making my determination, under Section 8 of the *Forest Act* (the *Act*), of the allowable annual cut (AAC) for Tree Farm Licence (TFL) 35.

Description of the TFL

TFL 35, also known as the Jamieson Creek TFL, is located approximately 40 kilometres north of the city of Kamloops in the British Columbia Forest Service (BCFS) Kamloops Forest District. It lies to the west of Heffley Creek and is surrounded entirely by the Kamloops Timber Supply Area (TSA). The total area of the TFL is 36 564 hectares, of which 35 429 hectares are productive forest and 31 172 hectares are assumed to be available for timber harvesting in the long term.

The TFL contains numerous small waterways and lakes, including Jamieson Creek, which runs in a general northwest to southeast direction through the licence area. Topographically, it is characterized by mid-elevation plateaux and gently rolling slopes. The eastern half of the area lies primarily within the Montane Spruce biogeoclimatic zone, with small patches of Interior Cedar-Hemlock and Interior Douglas-fir in the northeast and southeast corners. The western half is located predominantly within the Engelmann Spruce-Subalpine Fir biogeoclimatic zone. While many of the stands are of mixed species composition, the principal tree species are lodgepole pine, Engelmann spruce, subalpine fir, and interior Douglas-fir.

History of the AAC

The AAC for TFL 35 was determined to be 33 131 cubic metres when the licence was first issued in 1959. The AAC increased to 50 970 cubic metres and 82 119 cubic metres in 1963 and 1967, respectively, due to changes in inventory techniques and utilization standards. Further improvements in utilization standards resulted in another increase in the AAC in 1968, to 99 109 cubic metres. By 1983, the AAC had been decreased to 88 000 cubic metres. It remained at this level until 1992 when the AAC was increased to 130 000 cubic metres.

The current AAC was set at 125 600 cubic metres in October 2001. The AAC is allocated to the licensee in its entirety because BC Timber Sales (formerly the Small Business Forest Enterprise Program) does not operate within the TFL area.

The *Forest Act* requires that AACs be re-determined at least once every five years. Therefore a new determination for TFL 35 has been scheduled for late 2006. For the reasons described in this document, however, I have concluded that a change in the AAC is needed before then.

Critical Issues: The McLure fire and the Mountain Pine Beetle Epidemic

In the summer of 2003, the Southern Interior of the province experienced one of the worst wildfire seasons on record. Catastrophic fires burned a significant amount of timber in the Kamloops Timber Supply Area, including the McLure fire, which damaged or destroyed approximately 2710 hectares of forest in the north-east corner of the TFL. In the fall of 2003 the licensee surveyed the damaged stands and while most were severely burned, some older stands and plantations were less severely burned. The latter will be monitored for survival and possible rehabilitation. Of the severely burned stands, the licensee estimates 210 000 cubic metres can be

salvaged. Given the prior drought conditions and the severity of the burn, most of the timber will be susceptible to checking and needs to be harvested prior to the summer of 2004

In addition, TFL 35 lies within a vast area in central British Columbia that is experiencing a mountain pine beetle (MPB) epidemic unprecedented in its severity and extent. In areas within and adjacent to the TFL, the infestation has been expanding exponentially, both in terms of the area infested, and in terms of the volume of trees killed. The amount of lodgepole pine within the TFL that is susceptible to the beetle is approximately 1.1 million cubic metres and it is found mostly in mixed species stands. The total volume in the mixed-pine stands greater than 60 years old is 3.5 million cubic metres, which is approximately 35 percent of the total volume within the timber harvesting land base.

Over the past six years the Licensee has maintained an aggressive suppression strategy of baiting beetles in flight and salvage harvesting infested stands. The 2002 flight resulted in a 76 500 cubic metres being salvage-harvested in 2003. The 2003 flight will result in a 2004 salvage program that is expected to be three times larger, or 240 000 cubic metres. Until 2004, the Licensee has been able to manage the salvage program within the AAC, but that is no longer the case

To the extent possible, harvesting activities are aimed at managing the current mountain pine beetle infestation by harvesting the most recently infested stands, and at recovering fire-damaged timber. If harvesting is not increased in the short term, much of the damaged timber will ultimately deteriorate and no longer be suitable for lumber manufacturing. Subsequent total losses could be significant.

The fire-damaged stands and beetle situation overwhelm all other factors in this determination. I have documented my considerations regarding management objectives for the control of the beetle and salvage of the fire- and beetle-damaged stands under Section 8(8)(e) of the *Forest Act*: *"abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area"*.

Although, I have reviewed all of the factors specified in Section 8 of the *Act*, and have given them due consideration, the only factors that will be discussed in detail in this rationale are First Nations considerations, two issues of concern noted in the 2001 rationale (marginally merchantable stands and terrain class IV/V stands), the implications of the McLure fire and the bark beetle epidemic.

New AAC determination

Effective March 1, 2004, the new AAC for TFL 35 will be 325 600 cubic metres, an increase of 159 percent from the previous AAC. The purpose of this increase is to facilitate increased harvesting in order to minimize timber losses due to the 2003 McLure fire and the current MPB epidemic. My reasons for setting the new AAC at this level are explained later in this document under *Reasons for decision*.

In the short term, I expect the licensee to focus primarily on mitigating losses to fire-damaged stands and beetle infested stands. This may well result in temporarily reducing the harvest of stands where the leading species is balsam, cedar, Douglas-fir or spruce.

This AAC will remain in effect until a new AAC is determined, which must take place within five years of this determination. However, I am prepared make a new AAC determination sooner if the merchantability of the burned timber is significantly less than expected, or if the mountain pine beetle population should collapse.

Information sources used in the AAC determination

- *Statement of Management Objectives, Options and Procedures (SMOOP)* for *draft Management Plan No. 9, TFL 35*, Weyerhaeuser Canada Limited, accepted February 15, 2000;
- *TFL 35, Twenty-Year Plan*, Weyerhaeuser Company Limited, accepted August 7, 2001;
- *Proposed Management Plan No. 9: TFL 35*, Weyerhaeuser Company Limited, submitted July 30, 2001;
- *Timber Supply Analysis Information Package: TFL 35*, Management Plan No. 9, Weyerhaeuser Company Limited, accepted February 21, 2001;
- *Timber Supply Analysis Report: TFL 35*, Management Plan No. 9, Weyerhaeuser Company Limited, accepted May 10, 2001;
- *TFL 35 Rationale for AAC determination*, Chief Forester, April 6, 1996;
- *TFL 35 Inventory Audit Report*, BCFS Resources Inventory Branch, July 28, 2000;
- Existing stand yield tables for TFL 35, accepted by BCFS Resources Inventory Branch, May 16, 2001;
- Managed stand yield tables and site index assignments, accepted by BCFS Research Branch, May 5, 2001;
- *Procedures for Factoring Visual Resources into Timber Supply Analyses*, BCFS, March 1998;
- *Kamloops Land and Resource Management Plan (KLRMP)*, July 1995;
- *Kamloops Higher Level Plan Order, Final*, March 13, 1996;
- *Forest and Range Practices Act*, consolidated to November 2002;
- *Forest Practices Code of British Columbia Act*, as amended;
- *Forest Practices Code of British Columbia Act Regulations and Amendments*, as amended;
- *Identified Wildlife Management Strategy*, February 1999;
- *Landscape Unit Planning Guide*, BCFS and MELP, March 1999;
- Letter from the Minister of Forests to the Chief Forester, dated July 28, 1994, stating the Crown's economic and social objectives;
- Memorandum from the Minister of Forests to the Chief Forester, dated February 26, 1996, stating the Crown's economic and social objectives regarding visual resources;
- Letter from the Deputy Ministers of Forests, and Environment, Lands and Parks, dated August 25, 1997, conveying government's objectives regarding the achievement of acceptable impacts of biodiversity management on timber supply;
- Memorandum from BCFS district manager, Tony Buckley to Bob Helfrich, manager, Weyerhaeuser Company Limited regarding district manager's guidance for old-growth management areas operationally and in the timber supply analysis, December 20, 2000;
- Field review of TFL 35 operating conditions and the associated discussions among Weyerhaeuser Company Limited staff, the deputy chief forester, and BCFS regional, district and branch staff, June 20, 2001; and
- Technical review and evaluation of current operating conditions through comprehensive discussions with BCFS and Ministry of Water, Land, and Air Protection (MWLAP) staff including the AAC determination meeting held in Kamloops on June 21, 2001.

TFL 35 – *Management Plan No. 9: TFL 35*, Weyerhaeuser Company Limited, effective November 01, 2001.

- Letter from Sean Curry Planning Forester, Weyerhaeuser Kamloops to Larry Pedersen, Chief Forester MoF requesting an immediate uplift to salvage merchantable fire and beetle damaged stands, October 15, 2003;
- Letter from Ken Baker, Deputy Chief Forester MoF to Sean Curry Planning Forester Weyerhaeuser Kamloops advising him to proceed with the necessary documentation for the October 15, 2003 uplift request;
- Presentation by Weyerhaeuser Company Limited regarding its fire and beetle salvage program, protection program, estimates of fire damage, estimates of current beetle infestation and susceptible pine, and revised timber supply analysis for the uplift request. Presented to BCFS staff in Victoria on December 18, 2003;
- Documentation of Weyerhaeuser's presentations to First Nations regarding uplift request to the Ministry of Forests;
- Technical review and evaluation of current operating conditions through comprehensive discussions with BCFS staff, December 2003 to February 2004

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires the chief forester to consider biophysical as well as social and economic information in AAC determinations. A timber supply analysis, and the inventory and growth and yield data used as inputs to the analysis, typically form the major body of technical information used in AAC determinations. Timber supply analyses and associated inventory information are concerned primarily with biophysical factors—such as the rate of timber growth and definition of the land base considered available for timber harvesting—and with management practices.

However, the analytical techniques used to assess timber supply are necessarily simplifications of the real world. There is uncertainty about many of the factors used as inputs to timber supply analysis due in part to variations in physical, biological and social conditions, although ongoing science-based improvements in the understanding of ecological dynamics will help reduce some of this uncertainty.

Furthermore, technical analytical methods such as computer models cannot incorporate all of the social, cultural and economic factors that are relevant when making forest management decisions. Therefore, technical information and analysis do not necessarily provide complete answers or solutions to forest management problems such as AAC determinations. The information does, however, provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information required to be considered in AAC determinations.

In determining the AAC for TFL 35, I have considered known limitations of the technical information provided, and I am satisfied that the information provides a suitable basis for my determination.

Statutory framework

Section 8 of the *Forest Act* requires the chief forester to consider particular factors in determining AACs for timber supply areas (TSAs) and TFLs. Section 8 is reproduced in full as Appendix 1.

In accordance with Section 23(3) of the *Interpretation Act*, the deputy chief forester is expressly authorized to carry out the functions of the chief forester, which include those required under Section 8 of the *Forest Act*.

The chief forester has expressed the importance of consistency of judgement in making AAC determinations. I also recognize the need for consistency of approach, and I am familiar with the guiding principles that the chief forester has employed in making AAC determinations. I find these principles to be reasonable and appropriate and I have adopted them as described below in making my AAC determination for TFL 35.

Guiding principles for AAC determinations

Rapid changes in social values and in our understanding and management of complex forest ecosystems mean that there is always some uncertainty in the information used in AAC determinations. When a large number of determinations are made for many forest management units over extended periods of time, administrative fairness requires a reasonable degree of consistency of approach in incorporating these changes and uncertainty. To make his approach in these matters explicit, the chief forester has compiled a set of guiding principles for AAC determinations. I have reviewed these principles and find them to be reasonable, and thus I have adopted and applied them as deputy chief forester in AAC determinations for TFLs. These principles are set out below. If in some specific circumstance I believe it is appropriate to deviate from these principles, I will provide a detailed reasoning in the considerations that follow.

Two important ways of dealing with uncertainty are:

(i) minimizing risk, in respect of which in making AAC determinations, I consider the uncertainty associated with the information before me, and attempt to assess the various potential current and future social, economic and environmental risks associated with a range of possible AACs; and

(ii) re-determining AACs frequently, to ensure they incorporate current information and knowledge, a principle that has been recognized in the legislated requirement to re-determine AACs every five years. The adoption of this principle is central to many of the guiding principles that follow.

In considering the various factors that Section 8 of the *Forest Act* requires the chief forester to take into account in determining AACs, I attempt to reflect as closely as possible operability and forest management factors that are a reasonable extrapolation of current practices. It is not appropriate to base my decision on unsupported speculation with respect either to factors that could work to increase the timber supply — such as optimistic assumptions about harvesting in unconventional areas, or using unconventional technology, that are not substantiated by demonstrated performance — or to factors that could work to reduce the timber supply, such as integrated resource management objectives beyond those articulated in current planning guidelines or legislation.

The *Forest Practices Code of British Columbia Regulations* were approved by the Lieutenant Governor in Council on April 12, 1995, and released to the public at that time. The *Forest Practices Code of British Columbia Act* was brought into force on June 15, 1995.

Although the Forest Practices Code has been fully implemented since the end of the transition period on June 15, 1997, the timber supply implications of some of its provisions, such as those

for landscape-level biodiversity, still remain uncertain, particularly when considered in combination with other factors. In each AAC determination the chief forester takes this uncertainty into account to the extent possible in the context of the best available information. In making my determination for TFL 35, as deputy chief forester, I have followed the same approach.

More recently, on January 31, 2004 the *Forest and Range Practices Act* came into effect, and will ultimately replace the *Forest Practices Code of British Columbia Act*. As the timber supply implications of this new *Act* and attendant regulations become clear and measurable, they will be accounted for in AAC determinations. Uncertainties will continue to be handled as they were under the previous legislative regime.

As British Columbia progresses toward completion of strategic land-use plans, the timber supply impacts associated with the land-use decisions resulting from the various planning processes are important to AAC determinations. Where specific protected areas have been designated by legislation or by order-in-council, these areas are no longer considered to be part of the timber harvesting land base or to contribute to the timber supply in AAC determinations.

Because the outcomes of planning processes are subject to significant uncertainty until formal approval by government, it has been and continues to be the position of the chief forester that in determining AACs it would be inappropriate to attempt to speculate on the timber supply impacts that will eventually result from land-use decisions that have not yet been taken by government. I consider this approach to be reasonable and appropriate. Like the chief forester, I will therefore not take into account the possible impacts of existing or anticipated recommendations made by such planning processes, nor attempt to anticipate any action the government could take in response to such recommendations.

Moreover, even where government has made a formal land-use decision, it may not always be possible to fully analyze and account for the consequent timber supply impact in a current AAC determination. In many cases, government's land-use decision must be followed by a number of detailed implementation decisions. For example, a land-use decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Until such implementation decisions are made, it would be impossible to fully assess the overall impacts of the land-use decision. Nevertheless, the legislated requirement for five-year AAC reviews will ensure that future determinations address ongoing plan implementation decisions.

A number of intensive silviculture activities have the potential to affect timber supply, particularly in the long term. As with all components of an AAC determination, like the chief forester, I require sound evidence before accounting for the effects of intensive silviculture on possible timber supply. Nonetheless, I will consider information on the types and extent of planned and implemented practices as well as relevant scientific, empirical and analytical evidence on the likely magnitude and timing of any timber supply effects of intensive silviculture.

Some have suggested that, given the large uncertainties present with respect to much of the data in AAC determinations, any adjustments in AAC should wait until better data are available. I agree that some data are not complete, but this will always be true where information is constantly evolving and management issues are changing. Moreover, in the past waiting for improved data created the extensive delays that resulted in the urgency to re-determine many outdated AACs in the mid 1990s. In any case, the data and models available today are improved from those available in the past, and will undoubtedly provide for more reliable determinations.

Others have suggested that, in view of data uncertainties, the chief forester should immediately reduce some AAC's in the interest of caution. However, any AAC determination made by the chief forester or myself must be the result of applying our individual judgement to the available information, taking any uncertainties into account. Given the large impacts that AAC determinations can have on communities, no responsible AAC determination can be made solely on the basis of a response to uncertainty. Nevertheless, in making my determination, I have made allowances for risks that arise because of uncertainty.

Overall, in making this AAC determination, as the deputy chief forester, I am mindful of the mandate of the Ministry of Forests as set out in Section 4 of the *Ministry of Forests Act*, and of the chief forester's responsibilities under the *Forest Practices Code of British Columbia Act*, the *Forest Act*, and the *Forest and Range Practices Act*.

Guiding principles with respect to First Nations

With respect to First Nations' issues, I am aware of the Crown's legal obligations, particularly as clarified in judgements by the Supreme Court of Canada and the British Columbia Court of Appeal. The AAC that I have determined should not in any way be construed as limiting obligations under these judgements, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within TFL 35, other than to emphasize the harvest of burned and beetle infested timber.

The British Columbia Court of Appeal decided in March 2002 that the Crown has an obligation to consult with First Nations with respect to asserted rights and title in a manner proportional to the apparent strength of the claimed interests. As a matter of course, I consider any information brought forward by all parties respecting First Nations' interests. In particular I consider information related to actions taken to protect interests, including operational plans that describe forest practices designed to address First Nations' interests. In this context, I re-iterate that my AAC determination does not prescribe a particular plan of harvesting activity, nor does it involve allocation of the wood supply to any particular party.

Subsequent to a determination, if I become aware of information respecting First Nations' interests that would substantially alter my understanding of relevant circumstances, I may revisit my determination sooner than as required by the *Forest Act*.

First Nations considerations

I am aware that the Kamloops, Skeetchestn and North Thompson Indian Bands of the Secwepemc Nation (Shuswap Nation) use portions of TFL 35 for traditional purposes. Aboriginal interests on the TFL include the continued ability to hunt, fish, and gather plants for food and medicinal purposes, and the maintenance of a cultural and spiritual link to the land.

With respect to Weyerhaeuser Company Ltd.'s most recent timber supply analysis, on December 2, 2003 Weyerhaeuser staff contacted Kamloops Indian Band Natural Resources Manager John Jules by email advising him of the company's uplift request. Weyerhaeuser's staff met with John Jules and Barry Bennett to discuss the reasons behind the uplift request, and the impact that increased harvesting would have. Given the need for salvage operations and that Weyerhaeuser is going to maintain log purchases from the Band and private land owners, I understand that the Band does not oppose the increase. I also understand that Spiyu7ullucw Ranch Corporation, owned by the Kamloops Indian Band, was recently awarded a

non-replaceable forest licence authorizing the harvest of 50 000 cubic metres of fire-damaged timber over three years.

On December 2, 2003 Weyerhaeuser staff contacted Mike Anderson, Skeetchestn Indian Band Natural Resource Manager, by email. On December 3, 2003 Weyerhaeuser and Skeetchestn staff discussed the uplift request and agreed that the information would be brought to the attention of the chief and council. I am not aware of any Skeetchestn Indian Band opposition to the AAC increase.

Weyerhaeuser contacted Nathan Matthew, Chief of the North Thompson Indian Band by letter. After a number of verbal communications, Chief Matthew wrote to Weyerhaeuser on December 24, 2003, outlining the Band's concerns regarding First Nation rights, title and need for consultation. I am aware that Weyerhaeuser replied on January 16, 2004, and that company staff met with Chief Matthew on February 5, 2004.

I met briefly with Chief Matthew in Vancouver on March 11, 2004. We discussed the situation that lead to the company's request for an increased AAC, and my reasoning as outlined in this document. Chief Matthew explained that the North Thompson Indian Band's interest area includes roughly the northern half of TFL 35. He outlined his Band's strategy concerning the maintenance and expansion of its sawmill north of Barriere.

I am aware that, through Simpcw Development Corporation, the Band recently acquired a non-replaceable forest licence authorizing the harvest of 150 000 cubic metres per year of fire-damaged timber for three years. I am also aware that the Band is a shareholder of Secwepemc Economic Development Corporation Ltd., which has recently acquired a non-replaceable forest licence authorizing the harvest of 230 000 cubic metres of fire-damaged timber over three years.

Chief Matthew explained that he views the acquisition of short-term licences as only a first step towards a secure supply of timber for the Band's sawmill. He envisages acquiring a portion of the recent temporary AAC uplift in the Kamloops Timber Supply Area, followed by a portion of the AAC that the Province is reallocating as part of its Forestry Revitalization Plan. Because the existing sawmill is suitable only for large logs (which are generally in declining supply), on the strength of the envisaged new licences, the Band hopes to add a smallwood side to the mill in order to secure a more stable employment base in the community.

In my discussions with Chief Matthew, I explained the nature of the tree farm licence held by Weyerhaeuser. Most significantly, I explained that the document gives the company exclusive right to manage the Crown land in question, and virtually exclusive right to the AAC determined for the area from time to time. I explained that the Province has, in timber supply areas, considerably more flexibility to accommodate First Nations interests in acquiring a timber supply. The exercise of this flexibility has been evident in the recent awarding of several non-replaceable forest licences to local First Nations in the area.

My conclusion with respect to the concerns of First Nations in the area is that none of them object to Weyerhaeuser's request for a temporarily increased AAC. They are, however, very interested in direct participation in the local forest industry. Recent direct awards of non-replaceable forest licences are indicative of the Province's desire to address that interest.

With respect to Weyerhaeuser's normal operations, I am advised that it regularly refers proposed Forest Development Plans (FDP) and FDP amendments to the First Nation in whose interest area cutblocks are proposed for harvesting. In previous contact with BCFS staff, local First Nations have indicated that employment of band members and economic benefit from forestry activities are their highest priorities. I understand the licensee has tried to provide economic opportunities to local First Nations when such opportunities arise.

I believe that consultations between the licensee and First Nations related to operational planning offer a good opportunity for sharing information. With this information, harvesting operations can be located, designed and timed to protect habitat, riparian areas and food and plant sites as much as possible within the constraints presented by attempts to mitigate losses to the McLure fire and to the mountain pine beetle epidemic. I have no reason to believe that harvesting cannot be compatible with continued traditional use of the land base.

At this time, the nature, scope, and geographical location of potential aboriginal rights and title within TFL 35 remain inconclusive. To the extent that further information on aboriginal interests becomes available during the term of the new AAC, I will consider it in the next AAC determination. I encourage continued consultation with First Nations on operational activities, as is normal practice in the TFL, to enable design and timing of forest operations to minimize and hopefully eliminate negative impacts on First Nations' interests.

As I have noted in my *Guiding principles with respect to First Nations*, the AAC that I determine should not in any way be construed as limiting the Crown's obligations as described in court decisions with respect to aboriginal rights and title. Although I am raising the AAC specifically to facilitate removal of fire-killed and beetle infested timber, the AAC that I determine does not prescribe any particular plan of harvesting activity within TFL 35 by requiring any particular area to be harvested or not harvested.

As I make my AAC determination, I am mindful of the responsibility of other statutory decision-makers to administer the determined AAC in a manner consistent with other legislation and with relevant decisions of the courts respecting the interests of First Nations.

Consideration of Factors as Required by Section 8 of the *Forest Act*

Section 8 (8)

In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(a) the composition of the forest and its expected rate of growth on the area

Marginally Merchantable Stands

In my AAC determination in 2001, I expressed concern about the economics of approximately eight percent of the timber harvesting land base that is categorized as being marginally merchantable. I understand that harvesting of such stands has been disproportionately low in the meantime. For the 1999 to 2003 period, records show that 79.4 hectares (3.6 percent) of the 2199 harvested hectares consisted of these stands. The 2004 forest development plan indicates that 6.4 percent of the planned harvest will be in such stands. I acknowledge that the short-term harvest is concentrated in mountain pine beetle infested and fire damaged stands and that harvesting the profile is therefore less of a priority. However, I continue to be concerned that not all of the marginally merchantable stands will contribute to timber harvesting land base and ask the licensee to continue to report on its performance in this regard.

Terrain Stability

In the 2001 timber supply analysis the licensee assumed all stands classified as terrain class V (293 hectares) should be excluded from the timber harvesting land base; whereas, all stands classified as terrain class IV (2339 hectares) should be included. The terrain class categories account respectively for one percent and 7.5 percent of the assumed timber harvesting land base. The harvest record shows that 45 hectares of terrain class IV were harvested between 1999 and 2003, amounting to 3.2% of the area harvested. The 2004 forest development plan includes an additional 68 hectares, equal to 4.8 percent of the area planned for harvest. I continue to be concerned that not all of the terrain class IV stands will contribute to the timber harvesting land base and ask the licensee to continue to report its performance in this regard.

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

The Fires of 2003

Over the past three consecutive years, drought conditions have persisted in BC's interior. By the spring and summer of 2003, drought codes leading up to the 2003 summer fires were twice as high as the previous 10-year average. The extended hot and dry weather led to one of the worst fire seasons on record, with extraordinary fire risks and extreme fire behaviour.

In the Kamloops area, the first major fire started on July 30, 2003 near McLure. In the following weeks, four more large forest fires (McGillivray, Venables Valley, Vermillion Creek and Strawberry Hill) were burning, as were a number of smaller wildfires in the Clearwater area. The extended drought, large expanse of heavy forest fuels, and extreme fire weather conditions caused the wildfires to spread rapidly. In total, the five major fires covered approximately 56 200 hectares. In addition, about 37 000 hectares of tenured range land, 2400 hectares of leased grasslands, as well private and Indian reserve lands were burned.

The fires of 2003 had significant impacts on communities such as Barriere and Louis Creek north of Kamloops. Many people were evacuated from their homes, and many homes and businesses were destroyed. As a result, many social, economic and environmental values were seriously disrupted by the fires.

The five largest wildfires burned important habitats such as mule deer ranges, and in some cases burned down to creek sides and affected riparian areas. In other cases, due to the loss of forest cover, hydrological processes and aquatic habitats may be affected. As these types of forest fires are natural disturbance events, natural processes will result in the establishment of new forests over time. The process of reforestation will, of course be much faster when salvage-harvested areas are promptly reforested. Nonetheless, as the fires have already created disturbances, any further disturbances such as timber harvesting and rehabilitation efforts will need to be sensitive to minimize further impacts to the environment.

The McLure Fire

The McLure fire occurred primarily in the Kamloops TSA, but also burned 2711 hectares the in the northeast corner of TFL 35 within the Skull and Poison Creek drainages. The area within the fire perimeter was mapped in the fall of 2003 and the amount of area, by type, is shown in the following table.

Table 1. 2003 McLure Fire within TFL 35

Classification of the Land Base	Area Burned (hectares)	Percent of total area
Total area	**2711**	**100**
Swamp	26	1.0
Non-productive (e.g., grasslands)	7	0.3
Roads	37	1.4
Total Non-Forest	**69**	**2.6**
Non-commercial deciduous	7	0.3
Riparian Buffers	136	5.0
Terrain Class IV and V	175	6.5
Total Non-Timber Harvesting Land Base	**319**	**11.7**
Plantations	1211	44.7
Natural Stands less than 100 years old	244	9.0
Natural Stands equal to or greater than 100 years old	868	32.0
Total Timber Harvesting Land Base	**2323**	**85.7**

Assessments of the severity of the fire were made in fall and most of the stands over 35 years of age are not expected to survive. Because the fire was so intense, trees were killed instantly, or the roots were so badly damaged that the trees are not expected to survive. Due to the drought conditions of 2003 the fire-damaged trees have already begun to check, and therefore to lose their sawlog merchantability. Weyerhaeuser is therefore harvesting these trees before the summer of 2004 to prevent further losses. Some 100 hectares of Douglas-fir stands experienced less intense fires and will be monitored over the summer of 2004 for survival.

The fire in stands less than 35 years of age was generally less intense and most trees are expected to survive. These stands will be monitored over the summer of 2004 and rehabilitation will be planned accordingly.

The Licensee estimates the volume of fire damaged timber within the timber harvesting land base to be as high as 280 000 cubic metres of which 210 000 cubic is expected to be salvageable. Also, by the fall of 2004 the amount of site or stand rehabilitation within the fire perimeter will be better known and the licensee will act accordingly.

I accept the fire damage data and the estimates for the amount of salvageable timber for TFL 35, and that most of the older stands will have to be harvested before the summer of 2004 while they are still merchantable for sawlog timber. I expect that the Licensee will monitor and rehabilitate, to the extent possible, young or unsalvageable stands.

Mountain Pine Beetle Epidemic

- *the mountain pine beetle*

The mountain pine beetle (MPB), *Dendroctonus ponderosae* Hopkins (*Coleoptera: Scolytidae*) is widely considered to be the most damaging of all the insects that attack lodgepole pine in western Canada. The insect is a small, cylindrical-shaped bark beetle.

Generally, the mountain pine beetles fly during mid-late summer seeking mature - overmature lodgepole pine trees. Upon locating a suitable host, females bore through the bark and start construction of an egg gallery in the sapwood and inner bark near the base of the tree. If the tree is young and growing vigorously, it can flood the beetle out with resin. Lodgepole pine approximately 80 years old or older usually cannot produce enough resin to evict the beetle. If not evicted, the beetle emits a pheromone attractant that induces a mass attack that can overwhelm the host tree.

The beetle introduces fungi that produce blue stain in the sapwood of the tree. These fungi interrupt the flow of water to the crown of the tree reducing the production of resin. Brood over-winter as larvae and feed on the inner bark of the tree. Unless killed by very cold temperatures over winter, or removed from the site by harvesting, the brood will emerge as adults during the next growing season and attack neighbouring susceptible host trees.

More specifically, brood will be killed by early fall temperatures of -18^{o} Celsius but can survive to -37^{o} during winter. However, several days of winter temperatures below -27^{o} will kill a large portion of the population. Once the maturing larvae have resumed feeding in the spring, they again become very susceptible to freezing temperatures. Since the impact of low temperatures is moderated by snow insulation, the snow pack can also be a critical factor to beetle survival.

It is a combination of the fungi retarding water flow and beetle larvae eating the inner bark, interrupting the flow of nutrients, that kills the tree during the second growing season after initial or 'green- attack'. The tree's foliage turns red in the late spring following attack. This is called 'red-attack'. In subsequent years the dead standing tree will loose its needles. This final stage is called 'grey-attack'.

More details of MPB's life cycle and devastating power in destroying forests are presented in Appendix 3 to this document, *Forest Insect and Disease Survey, Forest Pest Leaflet No. 76*, a Forestry Canada publication.

- *mapping the infestation and its expansion*

The past six years the mountain pine beetle population has expanded to epidemic levels in TFL 35 and the surrounding Kamloops TSA. Within the TFL the expansion has progressed from east to west, out of the relatively less susceptible stands in North Thompson Valley up into the highly susceptible stands on the Bonaparte Plateau. The population is also coalescing into larger, more continuous areas of infestation.

The method for identifying and describing the extent of the infestation on TFL 35 is a combination of an aerial survey sketch-mapping process and a ground survey. According to Weyerhaeuser, an assessment of infested trees is made in June each year to determine when detailed aerial surveys should be conducted in August. The purpose of the surveys is to identify parts of stands (polygons) that need to be ground surveyed and to detect trees missed from the previous year's program. Based on the ground survey results, each polygon is flagged for the upcoming harvest or for bait and harvest after the next year's flight. Table 2 is a summary of the detailed aerial overview flights and ground sampling results for the last three years in TFL 35.

Table 2. Summary of Sampling Results for the Last Three years.

Year	Number of Polygons	Area of Red Attack Trees (hectares)	Average Green Tree-to-Red Tree Ratio[1]
2001	25	124	3:1
2002	41	255	3:1
2003	62	833	5:1

1. Immediately after the mountain pine beetle flight each year, infested trees can only be detected by finding damage to tree bark from entry holes. These are green trees. In the spring following the attack, the foliage of such trees turns bright red. The foliage turns yellow to grey after 24 months.

The MPB infestation on TFL 35 has started to increase dramatically, following a pattern seen in recent years throughout much of the north-central interior of the province. If the current pattern of mild winters persists, the licensee expects the infested volume to remain at least as high despite its salvage efforts in 2004. I understand the licensee has made exemplary efforts to locate and remove all beetle-infested trees on the TFL land base. However, without an immediate AAC uplift the licensee will not be able to salvage harvest beetle infested timber because it will be limited by its five-year statutory cut control limit.

Table 3 shows the levels of beetle salvage, relative to the AAC, since 1999.

Table 3. Level of Beetle Salvage in TFL 35

Calendar Year	TFL AAC (m^3)	Beetle Salvage[1] (m^3)	Percent Salvage of AAC
1999	125 600	15 960	13
2000	125 600	35 520	28
2001	125 600	40 860	33
2002	125 600	37 260	30
2003	125 600	76 500	61

1. Including species other than lodgepole pine, as most stands within the TFL are of mixed-species composition.

I accept the licensee's assessment of the mountain pine beetle infestation and its resulting salvage program as the best available information. I specifically note that intensity of the infestation is increasing and that the volume of the salvage program probably will have to triple between 2003 and 2004. Unless severe and prolonged cold temperatures occur this spring or next winter, I expect rapid expansion will continue and within 2 years, put all lodgepole pine within the TFL at high risk of being killed.

Fire and Beetle Salvage Strategy for TFL 35

The licensee proposes to immediately harvest heavily fire-damaged stands in order to minimize the loss of sawlog merchantability. The volume considered to be salvageable in the immediate future is estimated to be 210 000 cubic metres. Less severely damaged stands will be monitored for survival and if required, will be harvested later in 2004. In conjunction with the fire salvage, the licensee will be harvesting mountain pine beetle infested stands based upon a harvest priority

system. Some incidental area will also be harvested to provide access to stands being salvaged or additional volume needed to maintain the economic viability of a given salvage area.

In 2003 the mountain pine beetle spread throughout the TFL, causing the licensee to adopt a harvest priority system for its salvage program. Each stand is ranked according to the intensity of the infestation, and the expected capacity to absorb the next beetle flight. The greater the intensity of green-tree infestation, and the lower the absorption capacity, the higher is the harvesting priority. Table 4 presents the priority ranking system for TFL 35.

Table 4. Priority Ranking Systems for TFL 35

Priority Ranking	Percent of Green Trees Infested	Absorption Capacity[1]
0	Nil	All live trees
1	< 2	Stand has enough suitable living host to absorb the next 2 flights
2	2 – 5	Stand most likely has enough suitable living host to absorb next flight
3	5 – 8	Stand has > 60% suitable living host to absorb next flight
4	8 – 10	Stand has > 50% suitable living host to absorb next flight
5	10 plus	Stand has < 50% suitable living host to absorb next flight

1. Absorption Capacity is based only on the lodgepole pine trees in each stand.

I understand that the licensee estimates that polygons ranked as Priority 4 and Priority 5 contain approximately 56 000 cubic metres, and 186 000 cubic metres respectively, of merchantable timber that is expected to be heavily impacted by bark beetle mortality in the near future. Based on that assumption, the 2004 beetle program is estimated to be 242 000 cubic metres, of which 23 percent is expected to be in Priority 4 polygons, and 77 percent is expected to be in Priority 5 polygons. Unless the beetle population collapses, the licensee expects the 2005 salvage program to be of the same magnitude, and to be distributed according to the same pattern across priority-ranked stands.

Within the TFL the licensee has mapped and ranked the susceptibility of pine stands to infestation. When the resulting map is overlaid with maps showing stands that are currently infested, it is clear that there are still significant volumes of pine at risk if the beetle population does not collapse.

The licensee acknowledges that its salvage strategy does not explicitly identify all the possible impacts that increased harvesting may have on non-timber values such as wildlife habitat, community watersheds and non-timber harvesting land base site rehabilitation. However, the licensee has committed to work within the bounds of the Kamloops Land and Resource Management Plan and its approved TFL Management Plan, or to initiate processes for plan changes or variances if necessary.

It is my explicit expectation that the licensee will utilize the AAC that I have determined in this rationale according to its fire and MPB salvage and control strategy.

Cut Control and Timber Supply Implications

The licensee's current five-year cut control period runs to the end of 2004, and includes the carry-forward of a 48 926 cubic metre undercut from the previous five years. The licensee has requested an AAC increase of 200 000 cubic metres, effective on January 1, 2004. Coupled with a planned harvest of 210 000 cubic metres of fire-killed timber and 240 000 cubic metres of beetle invested timber in 2004, that would allow the licensee to end the five-year period with neither a significant accumulated overcut, nor a significant accumulated undercut. Beginning the next five-year cut control period with an AAC that is 200 000 cubic metres greater than the current AAC would similarly avoid an overcut problem if indeed the beetle infestation warrants continuation of the accelerated salvage program in 2005.

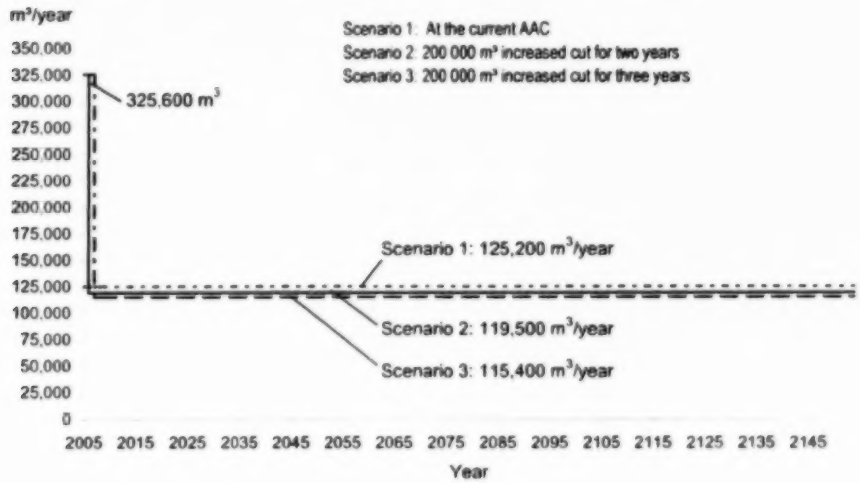
I am aware that Weyerhaeuser has three sawmills in the vicinity of TFL 35 and that much of the timber harvested on the TFL area is directed to these mills. I am aware that logs are purchased on the open market to meet mill needs, and that this practice will continue even with an increased AAC.

Given the urgency of addressing the licensee's request for an increased AAC, and because it was done relatively recently, I have accepted the licensee's 2001 timber supply analysis as a reasonable base for evaluating the short- and long-term impact of the 2003 McLure fire and the ongoing beetle infestation. The only modification to the 2001 modelling reflected the need to "re-grow" immature stands that were burned in 2003. It was not necessary in the model to invoke a high priority harvest for stands that were burned or are infested with beetles. That is because the TFL is wholly within one landscape unit and because the modelled harvest profile reasonably matched the harvest profile now anticipated for the next five years.

The analysis showed that if an additional 200 000 cubic metres is harvested for two years, relative to the 2001 base case, the short- and mid-term timber supply decreases to 119 500 cubic metres, which is 6100 cubic metres (or 4.9 percent) lower than the current AAC. Harvesting an additional 200 000 cubic metres for a third year would cause timber supply to drop to 115 400 cubic metres, which is 10 200 cubic metres (or 8.1 percent) lower than the current AAC.

These projections are illustrated in Figure 1.

Figure 1. Timber Supply Projections based on Accelerated Harvest Scenarios



I accept the licensee's analysis as the best available information, indicating that an uplift of 200 000 cubic metres for two or three years to recover damaged stands, should not result in a major disruption of short- to mid-term timber supply. Under those scenarios, the expected short- to mid-term decrease in timber supply would be limited to between 4.9 and 8.1 percent of the current AAC.

Reasons for decision

I have considered the information discussed throughout this document, and I have reasoned as follows.

The 2003 McLure fire burned approximately 2711 hectares within TFL 35. Within the timber harvesting land base approximately 868 hectares of mature timber were burned and the licensee estimates 210 000 cubic metres are merchantable if harvested before the summer of 2004. I recognize that delaying the harvest of this timber would increase the incidence of checking, rendering it non-merchantable for sawlog products.

On the TFL area, and based on recent experience elsewhere in the province, I conclude that approximately 1.1 million cubic metres of mature lodgepole pine is at high risk of attack by mountain pine beetle unless the epidemic is halted by extremely cold winter weather, freezing spring-time temperatures, or some other unforeseen factor. It is now March, and I believe that the epidemic will continue unabated for the remainder of 2004. To maximize the recovery of economic value from this resource, I have reasoned that the infested trees should be logged to the extent necessary to minimize losses of merchantable timber and to dampen the spread of beetles. In removing infested and susceptible pine trees, I recognize that it will often be necessary to log other species to minimize the risk of windthrow and for practical engineering reasons.

Although it is unlikely that the beetle population will expand so rapidly as to kill every pine tree over the next few years, I have concluded that it is prudent to expect a significantly expanding infestation in the short term. I therefore consider it prudent to increase the AAC to facilitate larger-scale control and salvage operations in the short term.

Until now the licensee has been able to conduct its salvage and beetle control harvesting within the bounds of the AAC. Given the dramatic increase in MPB infestation in 2003, the licensee's management strategy has changed to give increased harvest priority to stands with high incidence of green trees where the remaining trees are less likely to survive another beetle flight.

The licensee's timber supply analysis, indicates that a harvest level of 325 600 cubic metres for two or three years (i.e., an increase of 200 000 cubic metres to the current AAC) will not be disruptive to short- to mid-term timber supply. The licensee has committed to utilize its full AAC primarily in the burned and infested stands. I accept as reasonable the way in which the licensee modelled the impacts of the 2003 McLure fire and the ongoing mountain pine beetle epidemic.

I am aware that the timber from the TFL is directed to one of three local mills, depending on the species and size of the timber. I am also aware that the licensee has historically purchased a sizeable volume of large logs on the open market to run all three mills, and intends to continue doing so.

In deciding how much to raise the AAC, I note that legislation constrains the licensee to harvesting no more than 110 percent of the accumulated AAC in a five-year period, but the legislation no longer imposes a maximum in any given year. I note that the current five-year cut control period for TFL 35 ends on December 31, 2004. Within the immediately following years the licensee will have considerable flexibility within its cut control to maintain accelerated salvage operations if necessary.

Determination

I am making this determination in accordance with Section 8 of the *Forest Act*, and I am placing extraordinary emphasis on Section 8(8) (e), which stipulates that I must consider "abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area".

It is my determination that an AAC of 325 600 cubic metres is appropriate for TFL 35 in the immediate future. This represents an increase of 159 percent from the current AAC.

In my previous AAC determination in 2001 I did not find it necessary to attribute any portions of the AAC to any particular type of timber or terrain. It is my expectation that the licensee will dedicate virtually all of the new AAC to high priority fire-killed or beetle-infested stands, and therefore I again do not find it necessary to specify any partition.

This determination is effective March 1, 2004, and will remain in effect until a new AAC is determined. The *Forest Act* requires that AACs be re-determined within five years, unless the next determination is formally postponed according to provisions in the *Act*. Prior to this intervention, the next determination for TFL 35 was due in October 2006. In mid-2005 I intend to assess the state of the beetle epidemic on the TFL and to decide at that time whether a new timber supply analysis is required in support of an AAC determination in October 2006, or whether it is appropriate to continue the new AAC in order to facilitate continuing beetle-related harvesting.

Implementation

I have significantly increased the AAC for TFL 35 for only one reason, and that is to facilitate harvesting of timber that would otherwise be lost to the McLure fire and to the mountain pine beetle epidemic. I am aware that significantly increased harvesting over the next few years will almost certainly lead to a reduced AAC for subsequent years. It is therefore essential that the licensee focus its harvesting as much as possible on timber that would otherwise be lost to the fire and beetles.

I believe the licensee has made exemplary efforts to control the beetle population to date. I am relying on it to continue to operate according to its mountain pine beetle population assessments, green-tree surveys, beetle control measures and salvage programs.

The new AAC is predicated on there being approximately 210 000 cubic metres of fire damaged timber that must be harvested immediately, and an escalating mountain pine beetle infestation. The new AAC is also predicated on my understanding that the majority of the harvest will occur in fire damaged stands and stands with a high incidence of beetle-infested trees. I request that Kamloops Forest District staff continue to track the severity of the beetle epidemic on TFL 35 and advise me if harvesting priorities are not substantially in accordance with the above priorities.

Because the *Forest Act* no longer requires any licensee to harvest a minimum portion of its AAC in any given period, I encourage the licensee to not harvest its full AAC entitlement unless that is necessary to control the bark beetle infestation and avoid losses of merchantable timber.

Finally, I ask the licensee to advise me if it finds at any time that the AAC of 325 600 cubic metres is no longer needed to minimize losses to the mountain pine beetle epidemic.

Ken Baker

Ken Baker
Deputy Chief Forester

March 22, 2004

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the *Forest Act*, Revised Statutes of British Columbia 1996, reads as follows:
Allowable annual cut

8 (1) The chief forester must determine an allowable annual cut at least once every 5 years after the date of the last determination, for

(a) the Crown land in each timber supply area, excluding tree farm licence areas, community forest areas and woodlot licence areas, and

(b) each tree farm licence area.

(2) If the minister

(a) makes an order under section 7 (b) respecting a timber supply area, or

(b) amends or enters into a tree farm licence to accomplish the result set out under section 39 (1) (a) to (d),

the chief forester must make an allowable annual cut determination under subsection (1) for the timber supply area or tree farm licence area

(c) within 5 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and

(d) after the determination under paragraph (c), at least once every 5 years after the date of the last determination.

(3) If

(a) the allowable annual cut for the tree farm licence area is reduced under section 9 (3), and

(b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

the chief forester must determine an allowable annual cut at least once every 5 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).

(3.1) If, in respect of the allowable annual cut for a timber supply area or tree farm licence area, the chief forester considers that the allowable annual cut that was determined under subsection (1) is not likely to be changed significantly with a new determination, then, despite subsections (1) to (3), the chief forester

(a) by written order may postpone the next determination under subsection (1) to a date that is up to 10 years after the date of the relevant last determination, and

(b) must give written reasons for the postponement.

(3.2) If the chief forester, having made an order under subsection (3.1), considers that because of changed circumstances the allowable annual cut that was determined under subsection (1) for a timber supply area or tree farm licence area is likely to be changed significantly with a new determination, he or she

(a) by written order may rescind the order made under subsection (3.1) and set an earlier date for the next determination under subsection (1), and

(b) must give written reasons for setting the earlier date.

(4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).

(5) In determining an allowable annual cut under subsection (1) the chief forester may specify portions of the allowable annual cut attributable to

(a) different types of timber and terrain in different parts of Crown land within a timber supply area or tree farm licence area, and

(b) different types of timber and terrain in different parts of private land within a tree farm licence area,

(c) [Repealed 1999-10-1.]

(6) The regional manager or district manager must determine an allowable annual cut for each woodlot licence area, according to the licence.

(7) The regional manager or the regional manager's designate must determine a rate of timber harvesting for each community forest agreement area, in accordance with

(a) the community forest agreement, and

(b) any directions of the chief forester.

(8)In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a)the rate of timber production that may be sustained on the area, taking into account

(i)the composition of the forest and its expected rate of growth on the area,

(ii)the expected time that it will take the forest to become re-established on the area following denudation,

(iii)silviculture treatments to be applied to the area,

(iv)the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

(v)the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and

(vi)any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

(b)the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

(c)Repealed [2003-31-02]

(d)the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and

(e)abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

1998-29-2;1999-10-1; 2000-6-2; 2002-25-21; 2003-30-01; 2003-31-02

Appendix 2: Section 4 of the *Ministry of Forests Act*

Section 4 of the *Ministry of Forests Act* (consolidated 1988) reads as follows:

Purposes and functions of ministry

4. The purposes and functions of the ministry are, under the direction of the minister, to

(a) encourage maximum productivity of the forest and range resources in British Columbia;

(b) manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on British Columbia;

(c) plan the use of the forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are co-ordinated and integrated, in consultation and co-operation with other ministries and agencies of the government and with the private sector;

(d) encourage a vigorous, efficient and world competitive timber processing industry in British Columbia; and

(e) assert the financial interest of the government in its forest and range resources in a systematic and equitable manner.

Appendix 3: Extract from Unger, L. 1993. Mountain Pine Beetle. Forestry Canada, Forest Insect and Disease Survey, Forest Pest Leaflet No. 76, 7p

Introduction

The mountain pine beetle, *Dendroctonus ponderosa*, a native pest, is the most serious insect enemy of mature pines in western Canada. In British Columbia, major outbreaks occurred in all areas with a significant pine component, except for the northern quarter of the province. Since the first recorded infestations in 1913, in the Okanagan and Merritt areas, major infestations have occurred in Kootenay National Park and the Chilcotin Plateau in the 1930s, on Vancouver Island during the 1940-50s, near Takla and Babine lakes in the 1950s, and through much of the southern interior, Chilcotin Plateau and the Skeena and Nass river areas in the late 1970s and 1980s. Well over 500 million trees were killed by the mountain pine beetle during the past 80 years.

Outbreaks generally last 8-10 years and severely deplete the pine component of forest stands; trees with a diameter greater than 25 cm are particularly susceptible. Extensive mountain pine beetle infestations hasten forest succession, change the age and diameter distribution of the pine components of the forest, and reduce aesthetic values. Infestations can also cause marketing and operational problems and environmental concerns when large volumes of dead pine are harvested either for control or salvage purposes.

Large reserves of mature pine forest are always at risk in areas climatically favorable for the beetle. Good access to susceptible forests is needed so that preventative measures can be taken and so that infested stands can be quickly treated.

Hosts

The mountain pine beetle is distributed throughout British Columbia north to 56° latitude. Infestations have been recorded from sea level to the highest elevations where the host species grow. Native hosts include lodgepole pine (*Pinus contorta*), ponderosa pine (*Pinus ponderosae*), whitebark pine (*Pinus albicaulis*), and limber pine (*Pinus flexilis*). Some exotic pines may also be attacked. Occasionally non-host trees such as Engelmann spruce (*Picea engelmannii*) are attacked, but beetle populations do not persist in these occasional hosts.

Description and Life History

Adults are cylindrical, 3.7 to 7.5 mm long; teneral adults are light creamy-tan in color, changing to black when mature.

Eggs are pearly white, about 1 mm in size, and are laid singly in niches on both sides of the parent gallery.

Larvae are white legless grubs with red-brown heads, about 5 mm long in the fourth (final) instar.

Pupae are white at first, changing to light brown, about 5 mm long, with the external characteristics of the adult beetle visible.

The life cycle of the mountain pine beetle varies considerably. The normal cycle takes one year to complete; however, during warmer than average summers, parent adults may re-emerge and establish a second brood in the same year. Conversely, in cooler summers or at higher elevations, broods may require two years to mature. These variations in the life cycle may result in rapid increases in population levels, or conversely, sharp population decreases.

Beetle flights normally occur throughout July and into August, and generally peak in late July. Upon locating a suitable host, females bore through the bark to the phloem and cambium region, and start construction of the egg gallery, usually on the lower 5 m of the bole. The first females that attack a tree emit an aggregating pheromone which attracts mainly males. The males in turn emit pheromones attracting additional females. This leads to a mass attack which overcomes the tree's resistance. The egg galleries are usually about 30 cm long but occasionally they may reach 90 cm. They extend upward parallel to the grain and usually score both bark and sapwood. Eggs are laid in individual niches 0.5 cm apart along both sides of the gallery, and are tightly packed with frass. Eggs generally hatch in 10-14 days. Larvae feed on the phloem in individual mines extending, under uncrowded conditions, about 13 cm at right angles to the egg gallery. Broods overwinter mainly as larvae. Larval development is completed in early summer of the following year. When larvae mature, they excavate an oval chamber in which they turn into pupae. Following a short pupation period, pupae become adults. Newly formed adults, called teneral adults, spend a brief period feeding under the bark before the mature adults emerge by boring through the bark and fly to living trees to commence another cycle.

Fungi, yeasts, bacteria and other microorganisms associated with the beetle are carried by them into the tree. Some of these microorganisms are pathogenic to the tree or the bark beetle, while others are beneficial to the beetle. Fungi, which are commonly introduced by the beetle and produce blue stain in the sapwood, commence growth in the phloem and xylem soon after the beetles start their galleries. As the fungi become established they interrupt the flow of water to the crown and reduce the tree's pitch flow, which is its main defense mechanism against beetle attack. Successfully established bluestain fungi will also retain moisture in the sapwood and prevent excessive dehydration of the phloem, which is essential for brood survival. The combined action of the beetle and fungi kills the tree. Teneral adults need to feed on fungal fruiting bodies to mature, and specialized mouth parts of the beetle ensure that emerging beetles carry fungi to living trees.

Damage and Detection

Infested trees can be detected through crown and external symptoms, but the mountain pine beetle can only be positively identified (and the success of an attack can only be positively determined) by looking under the bark.

External evidence of beetle infestation on the bole usually consists of (i) pitch tubes on the stem where beetles have entered the tree, and (ii) boring dust at the base of the tree.

The color of the pitch tube often indicates the success or failure of the beetle attack. Scattered pitch tubes that are whitish in color indicate that the tree has repelled or killed the beetle by pitch exudation. In contrast, numerous reddish brown pitch tubes usually indicate that the attack has succeeded. However, pitch tubes remain pliable for several years, so soft pitch tubes do not necessarily mean that a tree is currently under attack. Pitch exudation may not occur during periods of drought or when trees are stressed due to root rot or other reasons. However, trees that have been recently and successfully infested will have dry boring dust in bark crevices and at the base of the tree. The boring dust is produced only during the initial stage of gallery construction and, depending on weather conditions, it may rapidly become inconspicuous. Woodpecker activity will often be greatly increased in infested areas, and woodpeckers will leave numerous pecking holes and may remove sections of the bark.

Characteristic symptoms under the bark include a vertical parent gallery with a slight J-like hook at the bottom and evenly spaced larval galleries extending at right angles from the parent gallery. Galleries are tightly packed with sawdust. The phloem will be dried out and brownish, and the sapwood will usually be stained a bluish color due to the fungi associated with the beetle.

Tree foliage begins to dry out as soon as the conduction of water up the tree is interrupted. As a result, the color of the foliage on infested trees gradually changes from bright to dull green. This early symptom in the lower crown will often become visible 2-3 months after attack. However, more distinct color changes occur during the onset of the growing season the spring following attack. Most lodgepole pine change from yellowish green to an orangey red by July and rusty brown by late summer. At this time most of the beetles will have left the tree. Other tree species display varying color patterns: ponderosa pine seldom turns red but develops more of a straw color, while white pine tends to become bright red. With time, retained foliage color becomes more dull, and most of the foliage drops in 2-3 years; this will vary from species to species and with weather conditions. These rapid and distinct color changes are used to schedule aerial mapping of recently attacked trees.

Beetles Associated with Mountain Pine Beetle

A number of secondary beetles are associated with mountain pine beetle and at times these secondary beetles make diagnosis of the causal agent of tree mortality difficult. Secondary bark beetles generally do not successfully establish in healthy, vigorous trees.

Several engraver beetles (*Ips pini, I. latidens* and *I. mexicanus*) attack fresh windfelled trees, logging residue, and uninfested portions of the boles of trees killed by mountain pine beetle, as well as trees of low vigor caused by root rots, stem diseases, defoliation, etc. Occasionally, however, they may become destructive in apparently healthy trees, but infestations are usually short. Since a portion of the population overwinters in the duff, extreme cold winter temperatures, which can devastate mountain pine beetle population, are much less destructive to the Ips beetles. As a result, these engraver beetles, which increased along with the mountain pine beetle population, may continue at epidemic numbers for 1 or 2 years.

Ambrosia beetles (*Trypodendron spp.* and *Gnathotrichus spp.*) are wood or pinhole borers that infest recently killed trees, fresh slash, and downed material. Infestation by these beetles can be recognized by the small piles of white boring dust surrounding the points of entry into the wood or around the lower portion of the stem.

The red turpentine beetle (*Dendroctonus valens*) bores under bark near the root crown and produces large reddish brown pitch tubes around the base of the bole. This is the largest of the *Dendroctonus* species: larvae are up to 12 mm long, and the reddish coloured adults generally are between 5 and 9 mm.

The lodgepole pine beetle (*Dendroctonus murrayanae*) attacks the lower metre of the stem forming an irregular vertical gallery with eggs laid in groups of 20-50 along both sides of the gallery. Larvae feed gregariously. Larvae and the reddish brown adults are only slightly smaller than the same stages of the mountain pine beetle.

Sour sap bark beetles (*Hylurgops* and *Hylastes spp.*) usually attack the stem near and below duff level. Adults are black or reddish, but tend to be shorter (3-6 mm) and more slender than mountain pine beetle.

Management

Prevention

The first step in prevention of mountain pine beetle outbreaks is to prioritize stands for preventive maintenance. To this end, risk and susceptibility rating systems have been developed combining the stand parameters associated with beetle infestations and the beetle pressure on a stand. Susceptibility increases in stands (i) with trees over 60 years of age (moderate susceptibility) and with trees over 80 years of age (high susceptibility), (ii) with trees over 25 cm in diameter, (iii)

with a high pine component, (iv) with a density between 750 and 1500 trees/ha, and (v) at lower altitudes and latitudes. The risk of an infestation developing within a stand is based on its distance to the nearest infestation and its level of current attack. For example, stands within 3 km of an active infestation and with more than 100 trees already attacked would be considered at risk. Risk factors can change dramatically within a year, while stand susceptibility changes gradually over a number of years.

Silvicultural treatments which help to reduce stand susceptibility include (i) reducing stand density to below 500 trees/ha, (ii) establishing an age and tree size mosaic within a stand or drainage, (iii) implementing a shorter rotation period, and (iv) establishing a species mix within a stand. The effectiveness of these measures may be reduced considerably in the presence of high beetle pressure, however.

Aerial surveillance, especially of moderate to high risk stands, will detect the initial phases of beetle invasion and allow for the early implementation of effective control measures.

Ground surveys should be conducted when pockets of discolored trees first appear in a stand to verify the causal agent and the status of the brood.

Applied Control

A variety of applied controls can be utilized, depending upon the extent of the beetle problem. In conjunction with controls, synthetic aggregating pheromones can be used effectively to concentrate beetle attack. This greatly improves the efficiency in locating newly attacked trees for follow-up treatment actions, or for containing most of an attack within a given harvesting area. Under specific conditions, mass trapping of beetles may prevent small local beetle populations from increasing or it may even reduce these populations to endemic levels. However, the effect of trapping becomes negligible when the beetle populations reach epidemic proportions.

During the initial phases of an infestation when only small infestation pockets are present, individual trees containing beetle brood can be treated by felling and burning, applying an appropriate silvicide to infested trees within 24 days of attack, application of a registered insecticide to the bole of infested trees just prior to beetle emergence, and the use of pheromone-baited, lethal (insecticide-treated) trap trees. Permits are required for such work in B.C. forests.

At intermediate infestation levels (up to about 100 trees per patch), small-patch logging can be used if good access is in place, and if beetle attack is concentrated naturally or through the use of pheromone baits. Beyond the intermediate stage, and when infestations exceed 10 ha, control becomes increasingly more difficult. In larger infestations the rate and range of beetle dispersion increases and any effective control program will require very extensive ground surveys to locate the green, newly attacked trees. Consequently, the only practical control measure at this stage is clearcutting well beyond the areas having red trees in order to remove trees containing beetles.

Natural Control

Resin flow and predation and parasitism are relatively ineffective in large infestations, but can be important in maintaining populations at endemic levels.

Resin flow is the tree's active defense mechanism against beetle invasion. It is effective in flushing out beetles (pitchout) or destroying eggs only when attack density is low, or when a high attack level is spread over a number of days. During periods of tree stress, such as drought, resin flow may be greatly reduced.

Predation and parasitism play a significant role in beetle population dynamics. Woodpeckers are the most conspicuous predators as they remove bark in search of beetle brood, in the process of

bark removal they also reduce the survival rate of the remaining insects due to desiccation. Perching birds also consume large quantities of flying beetles. Some of the more commonly encountered insect predators include the *clerid* (checkered) beetles, and *Diptera* (various true fly species). Several species of wasps occasionally kill large numbers of mountain pine beetles.

Temperature can be an important factor in determining population levels during the course of an infestation. Optimum under-the-bark temperatures for brood development are between 20 and 26°C. Cool summers may delay beetle flight and subsequently slow brood development, which can affect overwintering brood survival. Early fall temperatures of -18° will kill brood, while even less severe temperatures will kill eggs and larvae in the first three larval instars. The most cold-hardy stage, late-instar larvae, when conditioned for cold temperatures, cannot withstand temperatures below -37°; temperatures of -27° persisting for several days will kill a large portion of the population. Once the maturing larvae have resumed feeding in the spring they again become very susceptible to freezing temperatures. Since the impact of low temperatures is moderated by tree size, bark thickness and snow insulation, the duration of the cold period and snow pack is a critical factor to beetle survival.

Intraspecific competition affects brood production. High attack densities result in a more rapid rate of phloem desiccation; consequently, fewer adults emerge per unit area of bark surface. The adults which do emerge will also have a reduced capacity for egg production. Optimum attack densities appear to be between 3 and 10 per 1000 centimetres squared of lodgepole pine bark surface area, but it depends upon the thickness of phloem (food source). Food supply (phloem) is a main factor in regulating beetle populations. Beetles initially select larger diameter trees with thick phloem, in which populations can increase rapidly. As an infestation progresses and the larger diameter trees have already been killed, smaller trees with thinner phloem are attacked resulting in smaller broods. These trees will also dry out faster, leading to increased brood mortality. In general, when beetles attack trees under 25 centimetres in diameter, the number of progeny emerging will progressively become less with decreasing diameter.

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Documents attached:

Appendix 4: Minister of Forests' letter of July 28, 1994

Appendix 5: Minister of Forests' memo of February 26, 1996

File: 10100-01

JUL 28 1994

John Cuthbert
Chief Forester
Ministry of Forests
595 Pandora Avenue
Victoria, British Columbia
V8W 3E7

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

The *Forest Act* gives you the clear responsibility for determining Allowable Annual Cuts, decisions with far-reaching implications for the province's economy. The *Forest Act* provides that you consider the social and economic objectives of the Crown, as expressed by me, in making these determinations. The purpose of this letter is to provide this information to you.

The social and economic objectives expressed below should be considered in conjunction with environmental considerations as reflected in the Forest Practices Code, which requires recognition and better protection of non-timber values such as biodiversity, wildlife and water quality.

The government's general social and economic objectives for the forest sector are made clear in the goals of the Forest Renewal Program. In relation to the Allowable Annual Cut determinations you must make, I would emphasize the particular importance the government attaches to the continued availability of good forest jobs and to the long-term stability of communities that rely on forests.

Through the Forest Renewal Plan, the government is taking the steps necessary to facilitate the transition to more value-based management in the forest and the forest sector. We feel that adjustment costs should be minimized wherever possible, and to this end, any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.

.../2

Province of
British Columbia

Minister of
Forests

Parliament Buildings
Victoria, British Columbia
V8V 1X4

In addition to the provincial perspective, you should also consider important local social and economic objectives that may be derived from the public input on the Timber Supply Review discussion papers where these are consistent with the government's broader objectives.

Finally, I would note that improving economic conditions may make it possible to harvest timber which has typically not been used in the past. For example, use of wood from commercial thinnings and previously uneconomic areas may assist in maintaining harvests without violating forest practices constraints. I urge you to consider all available vehicles, such as partitioned cuts, which could provide the forest industry with the opportunity and incentive to demonstrate their ability to utilize such timber resources.

Yours truly,

Andrew Petter
Minister

Province of British Columbia
Ministry of Forests
OFFICE OF THE MINISTER

MEMORANDUM

File: 16290-01

February 26, 1996

To: Larry Pedersen
Chief Forester

From: The Honourable Andrew Petter
Minister of Forests

Re: **The Crown's Economic And Social Objectives Regarding Visual Resources**

Further to my letter of July 29, 1994, to your predecessor, wherein I expressed the economic and social objectives of the Crown in accordance with Section 7 of the *Forest Act*, I would like to elaborate upon these objectives as they relate to visual resources.

British Columbia's scenic landscapes are a part of its heritage and a resource base underlying much of its tourism industry. They also provide timber supplies that are of significant economic and social importance to forest industry dependent communities.

Accordingly, one of the Crown's objectives is to ensure an appropriate balance within timber supply areas and tree farm licence areas between protecting visual resources and minimizing the impact of such protection measures on timber supplies.

As you know, I have directed that the policy on management of scenic landscapes should be modified in light of the beneficial effects of the Forest Practices Code. In general, the new policy should ensure that establishment and administration of visual quality objectives is less restrictive on timber harvesting. This change is possible because alternative harvesting approaches as well as overall improvement in forest practices will result in reduced detrimental impacts on visually sensitive areas. Also, I anticipate that the Forest Practices Code will lead to a greater public awareness that forest harvesting is being conducted in a responsible, environmentally sound manner, and therefore to a decreased public reaction to its visible effects on the landscape. In relation to the Allowable Annual Cuts determinations that you make, please consider the effects that the new policy will have in each Timber Supply Area and Tree Farm Licence.

.../2

In keeping with my earlier letter, I would re-emphasize the Crown's objectives to ensure community stability and minimize adjustment costs as the forest sector moves to more value-based management. I believe that the appropriate balance between timber and visual resources will be achieved if decisions are made consistent with the ministry's February 1996 report *The Forest Practices Code: Timber Supply Analysis*.

Finally, in my previous letter I had asked that local economic and social objectives be considered. Please ensure that local views on the balance between timber and visual resources are taken into account within the context of government's broader objectives.

Andrew Petter
Minister of Forests